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(54) [Title of the Invention]

A turfgrass pathogen controlling agent

(57) [Abstract]

[Objective] To provide a turfgrass pathogen (pathogenic microorganism) controlling agent which contains an essential oil component as an effective ingredient.

[Constitution] A turfgrass pathogen controlling agent containing, as an effective ingredient, an essential oil component selected from amongst anise oil, thyme oil, cassia oil, perilla oil, yellow-cedar oil and bay oil, is a controlling agent having outstanding antimicrobial activity without environmental contamination.

[Scope of Claim]

[Claim 1] A turfgrass pathogen controlling agent containing, as an effective ingredient, one or more essential oil components selected from the group comprising anise oil, thyme oil, cassia oil, perilla oil, yellow-cedar oil and bay oil.

[Detailed Description of the Invention]

[0001]

[Industrial Field of Application] The present invention relates to a turfgrass pathogen controlling agent containing an essential oil component as an effective ingredient. More particularly, it relates to a turfgrass pathogen controlling agent containing essential oil components such as anise oil, thyme oil or cassia oil as an effective ingredient and which has

powerful antimicrobial activity against turfgrass pathogens such as Rhizoctonia, Pythium and the like.

[0002]

[Prior Art] Well-known diseases which occur in the turfgrass of golf courses and parks, etc, include the bare patches (*haruhagebyo*) which arise due to the pathogen Rhizoctonia, and the scorching (*akayakibyo*) caused by Rhizoctonia solania and Pythium (see *Kongetsu no Nogyo* [Farming Monthly] July 1991, pp28-35; Collected Papers of the *Nihon Shibakusa Gakkai* [Japan Turfgrass Association] 1992)).

[0003] Currently, in order to control these turfgrass pathogens, organic agrochemicals are used such as Captan (chief component: N-trichloromethylthiotetrahydrophthalimide), Daconil (chief component: tetrachloroisophthalonitrile) and Lobral (chief component: 3-(3,5-dichlorophenyl)-N-isopropyl-2,4-dioxoimidazolidine-1-carboxamide). These agrochemicals need to be used in considerable quantities so pollution of the natural environment has become a considerable social problem. Hence, in recent years, as a natural control agent, attention has been directed to wood vinegar which is a plant-derived material. Wood vinegar is said to enhance the resistance of turfgrass to pathogens and to have a grass sprouting and root growth promoting effect, so currently it is sprinkled onto many golf courses and the like.

[0004]

[Problem to be Resolved by the Invention] However, the antimicrobial activity of wood vinegar against the

turfgrass pathogens Rhizoctonia and Pythium is extremely low and, in fact, research by the present inventors has shown that there is no antimicrobial activity at the concentrations generally used. Consequently, the objective of the present invention lies in providing a turfgrass pathogen controlling agent which has powerful activity against turfgrass pathogens but does not show the problem of contamination of the natural environment.

[0005]

[Means for Resolving the Problem] With the objective of obtaining a turfgrass pathogen controlling agent which does not show the problem of contamination of the natural environment but has powerful activity against turfgrass pathogens, the present inventors have carried out an investigation into the extracted components of plant materials and, as a result, have discovered that specified essential oil components such as anise oil, thyme oil and cassia oil, etc, have an outstanding antimicrobial activity and that these essential oil components can meet the aforesaid objective. The present invention has been perfected based on this discovery.

[0006] Specifically, the present invention is a turfgrass pathogen controlling agent containing, as an effective ingredient, one or more essential oil components selected from the group comprising anise oil, thyme oil, cassia oil, perilla oil, yellow-cedar oil and bay oil. The essential oil components used as an effective ingredient in the present invention are all well-known. Anise oil is obtained by the steam distillation of the anise fruit, and contains anethole

as the chief component. Thyme oil, which is also known as "*tachi jakoso*" oil, is obtained by the steam distillation of the entire thyme plant (Taymus vulgaris L.; *tachi jakoso*). Its chief component is thymol. Cassia oil is obtained by the steam distillation of the leaves and stems of Cinnamomum cassia (Lauraceae family) and it contains cinnamaldehyde as a chief component. Perilla oil is obtained by the steam distillation of the leaves of Perilla frutescens (Lamiaceae family; *shiso*), and it contains perillyl aldehyde as the chief component. Yellow-cedar oil is obtained by the steam distillation of the leaves or woody parts of Chamaecyparis nootkatensis, and bay oil is obtained by the steam distillation of the leaves of Laurus nobilis. This contains eugenol as a chief component.

[0007] There may be used one of these essential oil components or a mixture of two or more may be employed. Such essential oil components are normally used diluted with water and, where required, a suitable organic solvent, and they may be employed in the form of a wettable powder, emulsion, solution or the like. Furthermore, they can also be used in the form of a powder employing a suitable solid support such as silica, kaolin or the like. Where required, normally-used surfactants, emulsifiers, dispersants, stabilizers, fungicides, herbicides and the like may also be added to the controlling agent of the present invention. The content of effective ingredient in the controlling agent is normally 5-80 wt% and preferably 40-60 wt%. As the method of application of the controlling agent of the present invention, there is normally used the method of scattering or sprinkling onto the turfgrass by the usual means. The amount of effective component applied can be

varied in accordance with the method of application and the type of effective ingredient but, normally, it is 0.1 to 10 g/m^2 and preferably 0.5 to 1 g/m^2. Any type of grass may be treated using the controlling agent of the present invention, and examples include seiyo grass, korai grass and noshiba grass, etc.

[0008]

[Effects of the Invention] The turfgrass pathogen controlling agent of the present invention contains a specified essential oil component such as anise oil or thyme oil as an effective ingredient. These essential oil components have outstanding antimicrobial activity against a wide range of turfgrass pathogens. At the same time, said essential oil components are very safe in that they are used in foods and fragrances, etc. Moreover, since the vapour pressure of the essential oil components is high, when they are applied to the turfgrass they evaporate within a few days and do not persist for a long time, so they have no adverse effects on rivers, etc.

[0009] Below, the present invention is explained in further detail be means of experimental and practical examples.

Experimental Example

Test of Antimicrobial Activity against Grass Pathogens

Experimental Materials

medium	PDA medium (potato-dextrose-agar; produced by the BBL Co.)
test microorganism	"Large Patch Fungus"; Rhizoctonia solania (AG-2)
	"Yellow Patch Fungus"; Rhizoctonia solania (AG-D)
	"Brown Patch Fungus"; Rhizoctonia solania (AG-1)
	Pythium Fungus; Pythium aphanidermatum UOP-304

Experimental Method

1. The test essential oil component was diluted with 95% ethanol containing the emulsifier Tween 20 (0.01%), and then added to PDA medium. The ethanol concentration in the medium was 1%. In the measurement of the MIC of the respective essential oil components, agar was extracted using a cork borer of diameter 10 mm from PDA medium in which the test microorganism [see "*Green Kenkyu Hokoku-shu* 7, 58, 1964; *Nihon Shokubutsu Byori Hokoku* 38, 182, 1972; Turfgrass Pathogens of Golf Courses (published by the Soft Science Co.)] had been grown, and this was placed on PDA medium containing the essential oil component and culturing carried out for 3 days at 25°C. The minimum inhibitory concentration (MIC) referred to here is that concentration which totally inhibits the growth of the pathogen, and it denotes that concentration where there was no growth of the microorganism in the medium over the 3 days.

Experimental Results

The results obtained in the MIC measurements were as follows.

[0010]

[Table 1]

Antimicrobial Activity (MIC; ppm) of the Essential Oil Components

	"Large Patch"	"Yellow Patch"	"Brown Patch"	Pythium
anise oil	100	80	80	80
bay oil	100	80	60	80
cassia oil	80	80	80	80
perilla oil	100	80	80	80
thyme oil	40	50	50	40
yellow-cedar oil	80	100	100	1000
[comparative samples]				
wood vinegar	>1000	>1000	>1000	>1000
Lobral	1000	5	500	500
Guransa[i]	5	5	5	1

[0011] From the experimental results, it can be seen that the essential oil components completely inhibited the growth of the turfgrass pathogens at concentrations of no more than 100 ppm. Wood vinegar, which is used as a natural non-agrochemical antimicrobial shows no inhibitory effect even at a concentration of 1000 ppm. Hence, it can be said that wood vinegar is in fact an ineffective reagent. When a comparison was made with the effects of Lobral and Guransa which are used as agrochemicals, it was found that the effects of Lobral differed according to the particular turfgrass pathogen. When Lobral and the essential oil components of the present invention were compared, it was found that the essential oil components had a growth inhibiting effect

which did not depend on the particular type of turfgrass pathogen, so these essential oil components can be said to have a broad antimicrobial spectrum.

[0012] Practical Example

Production of a wettable powder

A wettable powder was prepared in the normal way using the following components.

thyme oil	75 parts by weight
polyoxyethylene nonylphenyl ether	9 parts by weight
calcium lignin[ii] sulphonate	2 parts by weight
water	64 parts by weight

Translator's notes

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[i] This is a transcription of the Japanese commercial name. The English name has not been identified but from the Internet the product seems to be the same as "Rizolex".

[ii] Strictly speaking the Japanese says "sognin sulphonate" but it is assumed this is a misprint for "lignin sulphonate"